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# TEACHERS' PERCEPTION AND USE OF CREATIVITY FOSTERING BEHAVIOUR IN TEACHING SECONDARY SCHOOL BIOLOGY: A STUDY OF GENDER DIFFERENCES

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***ABSTRACT***

***This study examined perception and use of creativity Fostering behaviour among biology teachers with respect to gender in Obollo Afor Education zone of Enugu state. The design of the study was causal comparative (ex-post – facto) design because the variables being investigated are pre-existing and so could not be manipulated to determine the effect of independent variable on dependent variable. Teacher Creativity Fostering Behaviour Index (TCFBI) was used to specifically measure levels of perception and use of teacher creativity fostering behaviour in biology classrooms. Three research questions and three hypotheses guided the study. Twenty-four (24) biology teachers selected through proportionate random sampling technique from 30 public secondary schools in Obollo-Afor Education Zone of Enugu state, participated in the study. Mean and standard deviations were used to answer the three research questions while ANOVA was used to test the hypotheses at 0 05 level of significance. The result of the study revealed that (1), few Biology teachers (16.6%) adopted creativity fostering behaviour in teaching Biology; (2), male biology teachers had higher levels of perception and use of creativity fostering behaviour than their female counterparts. (3), there is a significant difference between male and female biology teachers with regard to perception and use of different component of creativity. It was recommended that favourable climate and favourable working atmosphere should be put in place to ensure effective process of teaching and learning Biology using TCFB especially as it concerns female students.***

***KEYWORDS:*** *Creativity, Fostering Behaviour, Levels, Biology Teacher, Gender*

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Original Article

## INTRODUCTION

Science and technology are believed to have contributed immensely to man's daily struggle to control his environment and build a virile world. Sound national development arises from areas of science and technology. That is why, perhaps, many nations now make frantic efforts to promote the study of science subjects in their schools so as to enhance the advancement of science and technology skills among students. Such science subjects include biology among others. Biology is a natural science consisting of contents from microscopic organisms to the biosphere in general, encompassing the earth surface and all living things (Okwo & Tartiyus, 2004). This subject is essential for the nation's science and technological development especially in areas of manufacturing and processing, food productions, medicine, and pharmaceuticals among others (Nwagbo & Okoro, 2012). Consequent upon this, Nigeria hopes to achieve technological development and self-reliance for her citizens through the study of biology.

Relevance of biology not withstanding several research studies have reported low academic achievement in the subject. Okoro (2018) revealed that the failure rate among students in biology in SSCE has remained very high. This development does not augur well for the science and technological growth in Nigeria. Several factors for poor performance in biology have been suggested in the past studies which include large curriculum contents, large

class size and lack of instructional materials. Ibe (2011), attributed the poor performance to teachers' inability to use appropriate and effective teaching strategies in their teaching. This implies therefore, that biology teachers should adopt innovative and imaginative skills in order to boost students' academic achievement in biology Vis-a-vis science and technological development.

One of the ways nations can survive the compelling challenges posed by science and technological development requires using creativity in teaching and learning of science subjects especially biology. A creative teacher needs to possess creativity behaviour to be able to effectively design and implement innovative strategies in biology classrooms. In the context of this study, creativity is the ability to create new ideas or generate multiple and innovative process that stimulates and support learners' motivation and enthusiasm in the classroom setting. Similarly, creative teaching refers to the application of original teaching techniques to the systematic seeking of resources and expression of creativity. The biology teacher should therefore endeavor to apply creativity behaviour in order to enhance students' academic achievement. This objective can only be achieved if the biology teacher has knowledge of the concept.

Research studies have revealed that science teachers have limited understanding of the concept of creativity and creative teaching. Kampylis (2009) reported that science teachers rarely exhibit creativity behaviour in biology classrooms. Okoli and Mbonu (2014) argued that many science teachers do not bring creativity into the classroom because they do not have the mindset to produce exciting and creative lessons. The most crucial means of enhancing creativity behaviour is probably related to teachers' knowledge of the concept of creativity, their attitude and behaviour towards students. (Okoro, 2018). The biology teacher with an improved knowledge of creativity could generate a creative environment in which individual differences are appreciated.

Creative teachers are often identified by being model of creative attitude, solving problems in an original fashion, communicating values which foster creative mindset. Teachers with the above characteristics are described by Runco (2007) as those with high perception of creativity behaviour while teachers with practices that focus on notion acquisition and repetition are classified as those with low perception of creativity behaviour. Based on the above findings, teachers who fall between the high and low creativity levels can be said to belong to moderate creativity level. Perception and use of Creativity behaviour, however, differ among individual teachers, and according to their different background variables (Naderi, 2008, Habibollah, 2008).

One important variable of interest in the present study is gender. Gender differences in creativity have remained a burning issue and have also remained relevance in education because it has been linked with performance and participation in certain professions. Ugwuadu (2011) describes gender as social or cultural construct, behaviour and roles which society ascribe as males or females. Gender in the current study refers to the attitudes, feelings and behaviour associated with persons' biology sex.

Meanwhile, differences in perception and creative accomplishments among male and female teachers have been adequately documented in past research studies. Howared as cited in Olatoye, Akintude and Ogunsanya (2010) opined that creativity is commonly found more among males than females due to set role emphasized in society. Kaufman (2010) argued that girls and boys or men and women simply do not live in environment that is equally conducive for creative accomplishment. Boys and girls grow up in different socio-cultural environment and rapidly become different. Vernon as cited in Baer and Kaufman (2010) argued that although social environmental influences are certainly major causes of differences in the number of highly creative men and women in various fields, these factors are not sufficient explanations for the components of creativity that have been observed. It is difficult to approve of males or females becoming highly

talented performers in all aspects of creativity. For instance, it is quite common to observe females demonstrate high perception of creativity in initiative, artistry, inquisitiveness and imagination, while on the other hand, the males are highly talented performers in self- strength and environmental sensitivity.

Similarly, Chan (2005) asked 212 gifted Chinese students to self-assess their creativity, family hardiness and emotional intelligence and found no significant gender difference for all constructs of creativity. Amabile (in Kaufman, 2010) found no significant gender differences using Consensual Assessment Technique. In this study, subjects were asked to create something (a poem, story, collage, etc.). These products were later rated for creativity by experts and no gender differences were reported. An exploratory study conducted in Albania, Europe by Bilali (2013) found that female and male teachers had similar levels of creativity behaviour.

Kaufman, Baer and Gentile (2004) studied 102 poems, 103 fictional stories, and 103 personal narratives taken from the classroom writing study. In the study, eight graders from 32 states were asked to choose their two best pieces of writing that they had completed for their regular classroom assignments. Three groups of experts read all 308 pieces of writing. The experts included teachers of 8$^{th}$ grade creative writing psychologists who studied creativity, and creative writers who had extensive experience working with middle-school students. Across all groups of experts, no gender differences were found for the poems, stories or narratives.

Albeit, the above study dealt extensively with gender differences in creativity, no reference was made to male or female biology teachers and science related subjects. Instead of merely addressing the aspects of teaching practices that foster creativity in science or biology classrooms, the study embraced art-related courses- poems, fiction, stories and narratives. That is why creativity is often associated with arts or poetry (Sawyer cited in Cachia & Ferrari, 2010), but Feldman and Benjamin cited in Lin (2011) opined that the abilities or knowledge of creativity can be demonstrated in any subject including science and social sciences. This means then, that the result of the above findings could be relevant to the present study. For Ozkal (2014), creativity is not only related to artistic fields but could be found in science as well as in other fields of educational programs.

**Statement of the Problem**

In general, lack of differences in perception of creativity behaviour between male teachers and female teachers were the most dominated outcome of many studies reviewed above. Nevertheless, large gender differences in perception of creativity continue to exist. These differences to a large extent represent the most significant unanswered questions about gender and creativity. Moreover, little or no empirical research document was available which examined gender differences in perception of creativity behaviour with reference to biology teachers. In addition, only few past research studies that investigated creativity levels of teachers could consider gender differences of teachers with respect to components of creativity. The present study, therefore, aimed to examine perception of creativity behaviour of biology teachers with regard to gender differences and to determine whether their levels of creativity may be different for components of creativity. Given the goals of this study, the following research questions were posed to guide the study.

- What are the levels of perception and use of creativity behaviour of biology teachers?
- What are the mean scores of perceptions and use of creativity behaviour of male and female biology teachers?
- What are the mean scores of male and female teachers regarding the use of different components of creativity behaviour.

## METHOD

The design of the study was causal comparative (ex-post – facto) design because the variables being investigated are pre-existing and so could not be manipulated to determine the effect of independent variable on dependent variable. The study was carried out in Obollo Afor Education Zone of Enugu State with a population of one hundred and twenty (120) biology teachers (70 females and 50 males) in forty eight (48) public senior secondary schools for the 2019/2020 session (source: Planning and Statistics Units, Post Primary Schools Managements Board- PPSMB). The zone was chosen for the study due to the observed students' poor academic achievement in biology in the area over time.

The sample of the study was 24 (12 male and 12 female) biology teachers drawn from 30 public senior secondary schools in the zone. The researcher adopted proportionate stratified sampling technique for the study. Schools in the education zone were stratified into three (3) local government areas. Out of the forty-eight (48) schools in the zone, 30 schools were sampled as follows: 15, 5 and 10 schools from Igbo-Eze North, Igbo-Eze south and Udenu Local Government area respectively through balloting without replacement. In each of the sampled schools, 20% of the population of male and female biology teachers was used on the basis of proportionate sampling. This technique is appropriate for the study because it proves useful in sampling equal ratio of population, eg males and females in each of the strata of a given population (Ali, 2006).

Teacher Creativity Behaviour Index (TCBI), developed by Cropley as cited in Okoro (2018) was adopted in this study to specifically measure perception of teacher creativity behaviour in biology classrooms. The TCBI consists of nine components. Three statements or activities of the teacher behaviour in Biology classroom context were written to depict those teacher behaviour consistent with each component. The items were presented in a score sheet prepared and used by the researcher. Biology teachers were then observed during their classroom teaching in intact classes in each of the selected schools for two periods of 35 minutes per week, for five weeks. This is because the five concepts in biology selected for the study, photosynthesis, mineral requirements in plants, food substances in animals, Enzymes and modes of nutrition in plants and animals were taught for five weeks. Each item or statement of the nine principles or components scored one mark.

The average scores of Biology teachers in the TCB for the period of five weeks were collected using the score sheet. Those Biology teachers who scored 70 marks and above were categorized as high, those having marks 55 to 69 as moderate and those scoring below 55 marks as low creativity teachers. Three research questions were answered while three null hypotheses were tested at 0.05 level of significance

## RESULTS

The first analysis was a Chi square analysis to test the hypothesis that there will be no difference among biology teachers who employ high, moderate and low TCB. The second and third analysis was on the perception of teacher creativity fostering behaviour of male and female biology teachers and according to the nine (9) components of TCB: independence, integration, motivation, judgment, flexibility, evaluation, question, opportunity and frustration

**Research Question one** What are the levels of perception and use of creativity behaviour of biology teachers?

**Table 1: Mean and Standard Deviation of Teachers' Perceptions of Creativity Behaviour**

| *Creativity* | *N* | *X* | *SD* |
|---|---|---|---|
| High | 4 | 15.68 | 3.96 |
| Moderate | 7 | 15.63 | 3.95 |
| Low | 13 | 10.08 | 2.20 |
| **Total** | **24** | **41.39** | **10.11** |

Table 1 presents data on the scores of teacher creativity behaviour. The results in the table shows that four 4(16.6%) biology teachers had high perception of creativity fostering behavior with mean of 15.68 and standard deviation of 3.96. The data also revealed that seven 7(29.17%) biology teachers had moderate perception of creativity (M = 15.63, SD = 3.95). This was followed by 13(54.17) teachers who had low perception of TCFB (M = 10.06 SD = 2.20) respectively. All in all, results in table 1 indicate that majority of biology teachers had low perception of creativity behaviour.

**Research Question Two:** What are the mean levels of perception of creativity behaviour of male and female biology teachers?

**Table 2: Mean and Standard Deviation scores of teachers' perception of creativity behaviour by gender**

| Teachers Creativity | Gender | n | X | SD |
|---|---|---|---|---|
| High | Male | 3 | 1.92 | 0.529 |
| | Female | 1 | 0.68 | 0.458 |
| | **Total** | **4** | **2.60** | **0.258** |
| Moderate | Male | 5 | 1.58 | 0.322 |
| | Female | 2 | 0.69 | 0.139 |
| | **Total** | **7** | **2.27** | **0.461** |
| Low | Male | 5 | 0.50 | 0.101 |
| | Female | 8 | 0.76 | 0.154 |
| | **Total** | **13** | **1.26** | **0.255** |

Data presented in table 2 show that male biology teachers had higher perception of creativity fostering behaviour (M = 1.92, SD = 0.53) than their female counterparts (M = .68, SD = 0.46). Under moderate perception male biology teachers also scored higher (M = 1.58, SD = 0.32) compared to female teachers (M = 0.69, SD = 0.13). However, majority of the female biology teachers had low perception of creativity behaviour with the mean and standard deviation of 0.76 and 0.15 as against their male counterparts with the mean scores of 0.50 and standard deviation of 0.101. Differences also exist among biology teachers in TCB components as indicated in table 4 below.

**Research Question Three:** What are the mean scores of male and female biology teachers regarding perception and use of components of creativity fostering behaviour

**Table 3: Table of means and SD for the use of TCFB components by gender**

| TCFB Dimensions | M | SD | n |
|---|---|---|---|
| Independence | 5.38 | 1.17 | 24 |
| Integration | 4.08 | 1.74 | 24 |
| Motivation | 4.50 | 1.84 | 24 |
| Judgment | 4.82 | 1.83 | 24 |
| Flexibility | 5.38 | 1.41 | 24 |
| Evaluation | 3.92 | 1.56 | 24 |
| Question | 4.17 | 2.10 | 24 |
| Opportunity | 5.33 | 1.31 | 24 |
| Frustration | 4.04 | 1.94 | 24 |
| | **Gender** | | |
| Male | 5.25 | 1.50 | 13 |
| Female | 3.89 | 1.74 | 11 |

Table 3 shows that biology teachers' use of TCB was higher for independence (5.38), flexibility (5.38) and opportunity (5.33). They were followed by judgment (4.82), motivation (4.50) and question (4.17). The least TCFB levels were evaluation (3.92), frustration (4.04) and integration (4.08). Moreover, use of TCFB components was found to be higher among males than females.

**$H_{o1}$:** There is no significant difference in the level of perception of creativity behaviour among biology teachers**.**

**Table 4: Table of Chi square analysis**

| Levels of TCFB use | Observed N | Expected N | % | $\chi^2$ | df | Sig. |
|---|---|---|---|---|---|---|
| | | | | 7.0 | 2 | .030* |
| High | 4 | 8.0 | 16.67 | | | |
| Moderate | 7 | 8.0 | 29.17 | | | |
| Low | 13 | 8.0 | 54.17 | | | |

TCB = Teacher creativity behavior; * = $p<.05$.

From Table 4, it was discovered that 4(16.67%) of biology teachers belong to high perceptions of creativity fostering behaviour. 6(33.33%) have moderate perception of TCFB while 14(58.33%) have low perception. This difference was significant $\chi^2 = 7.0$, df = 2, $P<.05$ with majority of the biology teachers not using TCB in teaching biology. Results from table 4 show that majority of the biology teachers do not use TCB in teaching biology

**$H_{o2}$:** There is no significant difference in the perception and use of creativity behaviour among male and female biology teachers**.**

**Table 5: ANOVA for Testing Differences in the Levels of Perceptions of Creativity Behviour Among Male and Female Teachers in Teaching Biology**

| Source | Type III sum of Square | DF | Mean Square | F | Sig | Partial Eta Square |
|---|---|---|---|---|---|---|
| Corrected model | 224.945[a] | 17 | 13.232 | 6.096 | .000 | .344 |
| Interception | 4466.054 | 1 | 4466.054 | 2048.274 | .000 | .912 |
| TCFB Levels | 78.919 | 8 | 9.865 | 4.524 | .000 | .155 |
| Gender | 99.861 | 1 | 99.861 | 45.799 | .000 | .189 |
| TCFB Levels *Gender | 53.083 | 8 | 6.635 | 3.043 | .003 | .110 |
| Error | 429.538 | 197 | 2.180 | | | |
| Total | 5250.000 | 215 | | | | |
| Corrected Total | 654.484 | 214 | | | | |

ANOVA result as shown in Table 5 revealed that there is a significant difference in the levels of perceptions of creativity behaviour among biology teachers as indicated by 4.524 at 0 05 level of significance. There was also significant difference in the perception levels of creativity behviour of male and female biology teachers. This is indicated by the calculated F value of 45.799 which is significant at 0.05 level of probability. Thus, the null hypothesis of no significant difference is rejected.

**$H_{o3}$:** There is no significant difference among male and female biology teachers regarding levels of perception and use of components of creativity behaviour

**Table 6: ANOVA summary of test of between-subjects effects for TCB and gender.**

| SOV | SS | df | MS | F | **Partial Eta Square** |
|---|---|---|---|---|---|
| TCB | 78.92 | 8 | 9.87 | 4.52** | .155 |
| Gender | 99.86 | 1 | 99.86 | 47.80** | .189 |
| TCB*Gender | 53.08 | 8 | 6.64 | 3.04* | .110 |
| Error | 429.54 | 97 | 2.18 | | |
| Total | 5250.00 | 215 | | | |
| Corrected total | 654.48 | 214 | | | |

Note: * = $p<.01$; ** = $p<.001$

ANOVA result as shown in Table 6 revealed a significant difference in the use of TCB, $F$ (8,197) = 4.52, $p<.001$. Bonferroni pairwise comparison revealed that teachers use independence significantly more than frustration ($p<.05$). Integration is significantly used more than flexibility ($p<.05$) while there was no significant difference in the use of motivation, judgement, question and other TCB. However, evaluation is significantly used more than independence ($p<.05$), flexibility ($p<.05$) and opportunity ($p<.05$) while frustration was significantly used more than flexibility ($p<.05$). There was also a significant difference in the use of TCB between male and female biology teachers $F$ (1,197) = 47.80, $p<.001$. From the mean scores, males were found to use TCB more than females. Interestingly, a significant interaction between TCB and gender was found $F$ (8,197) = 3.04, $P<.01$.

## DISCUSSIONS

Results as indicated in table 1 show that differences exist in the levels of perceptions of creativity behaviours among biology teachers. Differences in the Creativity levels among biology teachers were further confirmed by the results in table 4 with the chi-square = 7.00 and an associated probability value of 0.030. This is in agreement with the previous studies (Okoli & Mbonu, 2014, Nwosu, 2004, Zaleha, Yudarian & Helen, 2014, Soh, 2015) which indicate that few Biology teachers are equipped with such capacity building behaviour as teacher creativity behaviours. Possible explanations of differences in perception of TCFB among biology teachers could be attributed to the environment in which teachers were asked to operate. A democratic environment or setting (Aguluna & Nwachukwu 2004) where people are allowed freedom of participation, adequate learning environment, in service training plus opportunity to interact with and explore environment are known to boost creativity. Conversely, competitive environment, limited choice of materials, voluminous content, lack of institutional support, heavy workload, (Ozkal, 2010) discourage the use of creativity behaviour in biology classrooms.

Also, Data presented in table 2 show that male biology teachers had higher perception of creativity fostering behaviour (X = 1.92, SD = 0.53) than their female counterparts (X = .68, SD = 0.46). Under moderate perception male biology teachers also scored higher (X = 1.58, SD = 0.32) compared to female teachers (X = 0.69, SD = 0.13). However, majority of the female biology teachers had low perception of creativity behaviour with the mean and standard deviation of 0.76 and 0.15 as against their male counterparts with the mean scores of 0.50 and standard deviation of 0.101. Differences also exist among biology teachers in TCB components as indicated in table 4 below. This was confirmed by the calculated F value of 45.799 which is significant at 0.05 level of probability in support of this. This is in line with the study of Howared

cited in Olatoye, Akintude and Ogunsanya (2010) who opined that creativity is commonly found more among males than females due to set role emphasized in the society.

Reasons for significant difference in perception levels of male and female students (with males ranking higher than females) could be linked to certain traditional beliefs which have greatly discouraged females from getting engrossed in creative ventures. For instance, it is on record that some cultures in Africa, particularly Nigeria, up till date still encourage their females to imbibe personality traits of docility, submissiveness, and passivity because most people believe that a woman's place is in her husband's kitchen and that her husband is her mouth piece. On the other hand, the males who are meant to become leaders are trained to be independent, assertive and adventurous (Imogie, 2010). Again, it is still a common belief among Nigerians that certain subjects like physics, chemistry, Biology and other technology subjects are solely reserved for the male folks while females find themselves into nursing, teaching and art related subjects. Data in table 3 also revealed that male biology teachers had higher perception levels of creativity fostering behaviour than their female counterparts in all the components of TCB. Supporting this view, Aguluma and Nwachukwu (2004)) observed that male teachers are more creative than the females. So, there seems to be some general factor at work that is limiting female accomplishment. We usually believe the primary general factor to be the initial requirement of environment. This is also in line with research showing that divergent thinking tests are, in general, more predictive of creative achievement in males than females (Mcvery, 2004).

## CONCLUSIONS

Results of the present study showed that the majority of the teachers were found to belong to low perception of creativity fostering behaviour. In addition, male biology teachers have higher perception than females. There is also a significant difference in their use of components of creativity behaviours. Evidence has shown that certain traditional beliefs, for instance, have greatly discouraged females from getting engrossed in creative ventures. It is, therefore, recommended that Federal and State Ministries of education should provide biology teachers with encouragement and supportive institutional environment which will enhance their creativity levels. The teacher training institutions and universities should include TCB principles in Biology method course content. This will ensure that the Biology teachers are adequately trained on how to incorporate the art in the course of instruction.

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